Strategies to compare FM5 (NPP) with FM3 (Aqua)

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Opening Remarks

- CERES ERB dataset continuity and consistency since 1998
  - TRMM/Terra (03/2000; PAPS mode)
  - FM1/FM2 (03/2000; XT mode)
  - FM1/FM4 (07/2002, 06/2003 - 2004; modified XT angle)
  - FM1/FM3 (since 06/2005; modified XT angle)
  - FM4/FM3 (07/2002; XT mode)
- Primary comparison of FM3 and FM5
- Secondary comparison of FM1/FM2 and FM5

Aqua/Terra and NPP Orbits

- Aqua/Terra
  - Altitude of 705km
  - Inclination angle of 98.18/81.82
  - Orbit duration of 1h 38min 52s; repeat cycle – 16 days
- NPP
  - Altitude of 830km
  - Inclination angle of 98.62
  - Orbit duration of 1h 41min 13s; repeat cycle – 27 days

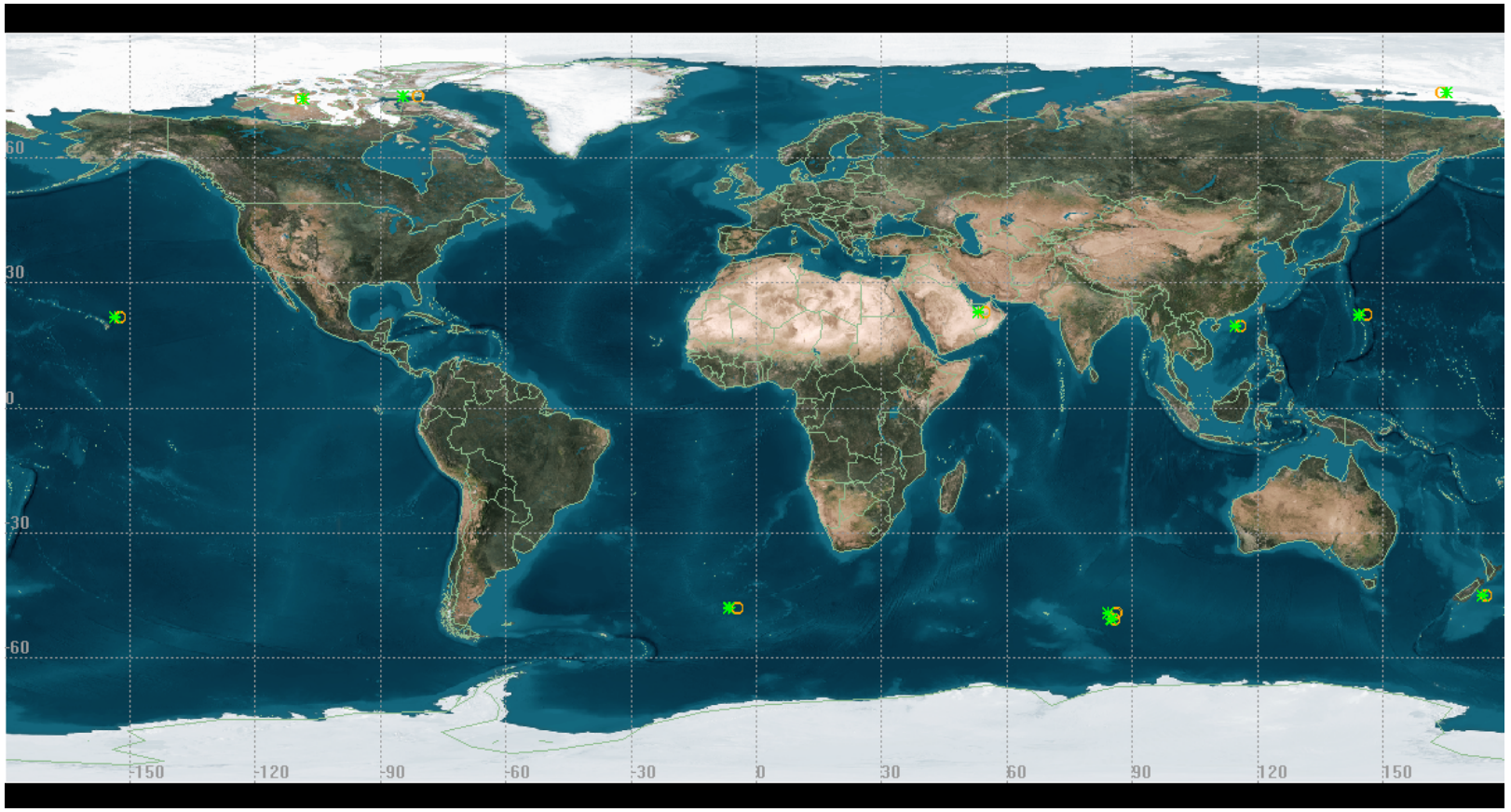
FM3 (FM1/FM2) and FM5 comparison opportunities

- Primary comparison of FM3 and FM5:
  - Ascending orbits
    - Orbit inclination angles differ by about 0.5°
    - Recurring opportunities
- Secondary comparison FM1/FM2 and FM5
  - Descending and ascending orbits
    - Orbit "intersections" at about 68°N (day) and 68°S (night)
    - Both satellites at the intersection within 5 minutes
    - Direct comparison to the climate instrument (FM1)

FM3 and FM5 comparison opportunities

- There are two different opportunities:
  - Simultaneous (less than 1 scan apart)
    - Groundtrack difference for lat < 0.25 deg; lon < 2 deg
    - Scanning the same gridded geolocations
    - Each opportunity lasting 1 minute
  - Matched sites (within 0.25deg)
    - Time differential < 5 min.
    - Groundtrack difference for lat < 0.25 deg.; lon < 0.25 deg
    - Comparison at the nadir within the size of a footprint
    - Varying duration of each opportunity from 1 to 5 minutes

FM3 and FM5 simultaneous



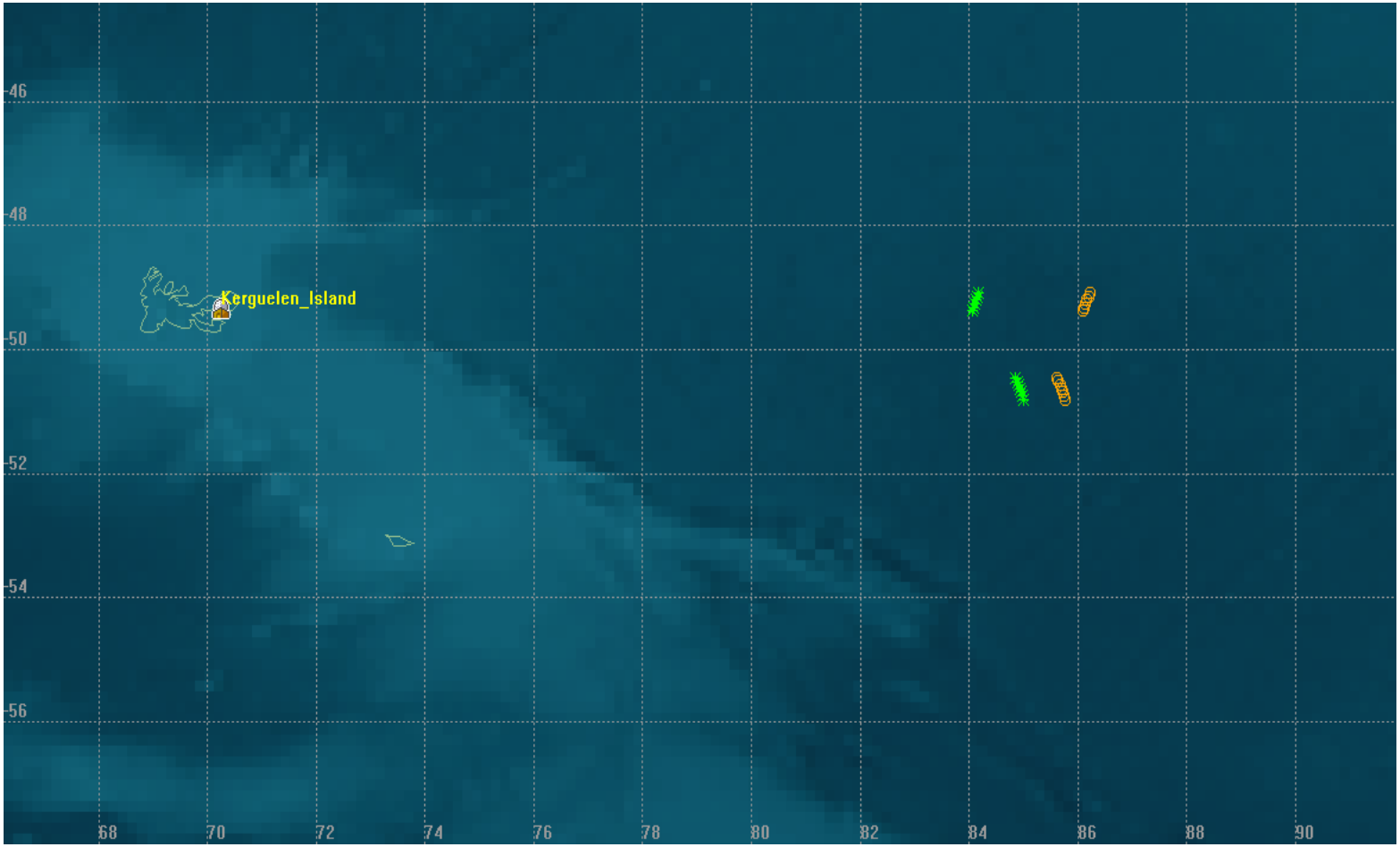
11 day-night opportunities within 27 days; about 64 hours apart

FM3 and FM5 simultaneous

- Both instruments stay in the XT
  - < 7 sec time differential for about 1 minute
    - gridded 1°×1° geolocations for comparison
      - RAZ < 1 deg; VZA < 5 deg
      - Low confidence mean (15-20 footprints) radiances
      - Data collection needed for at least a repeat cycle of 432 days
      - Statistics continuously improve with time

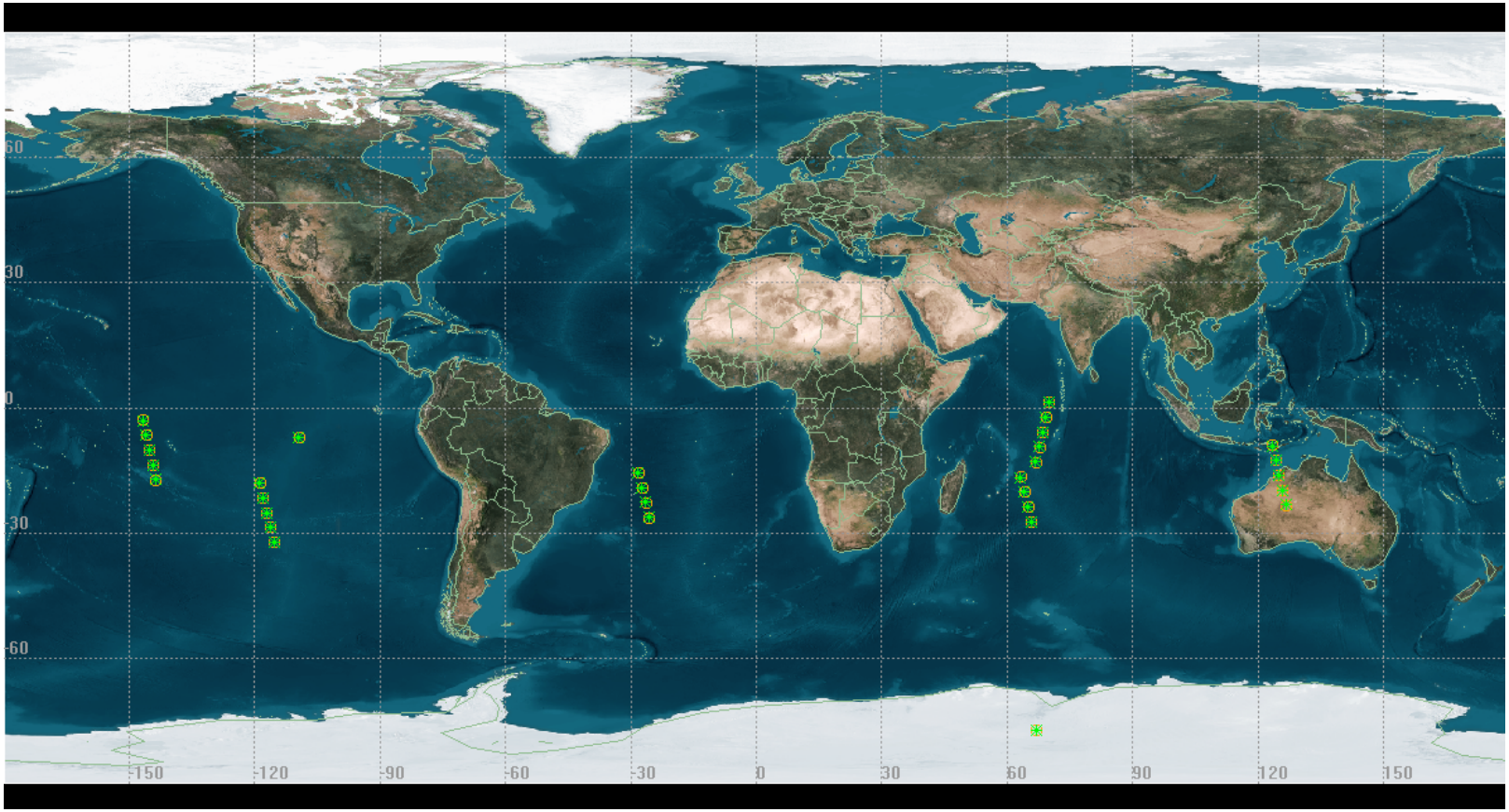
Unprecedented spatially and temporally matched unfiltered radiances for comparison

FM3 and FM5 simultaneous



Day or night comparison opportunity 1-min each

FM3 and FM5 matched sites



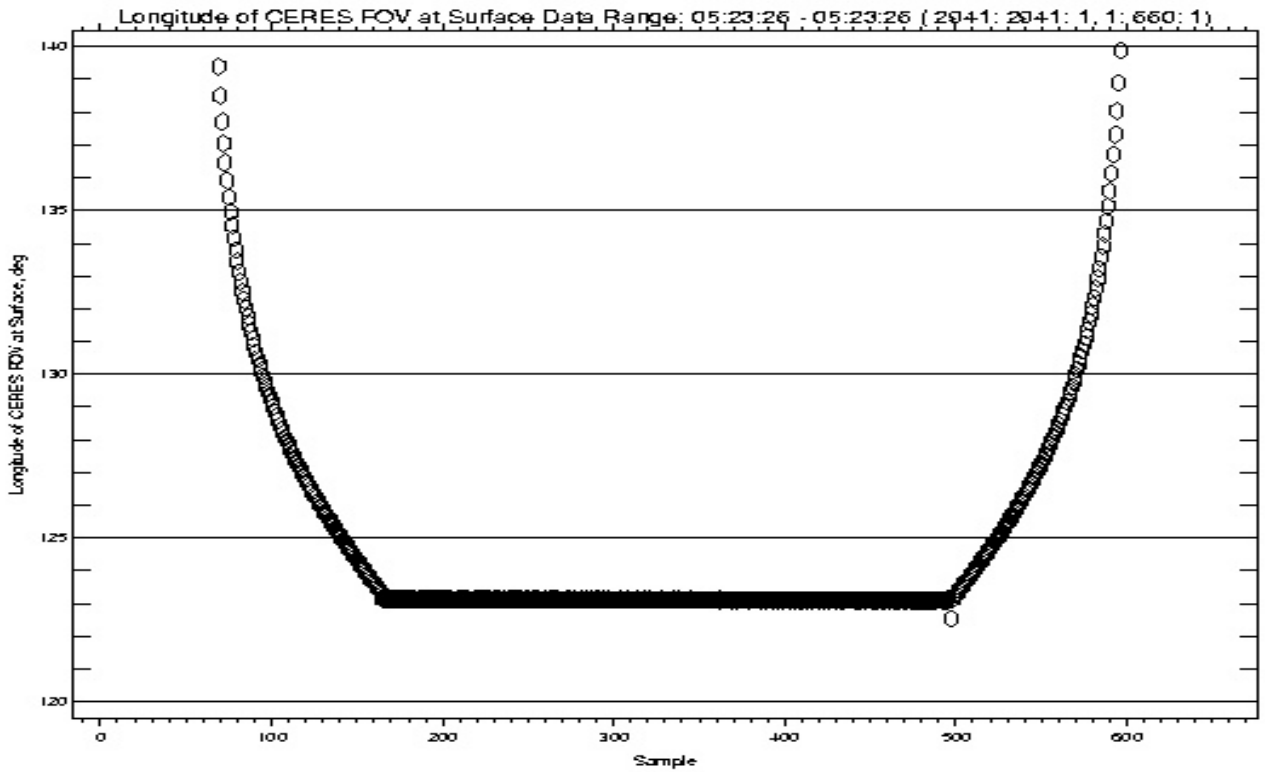
8 day-night opportunities within 27 days

FM3 and FM5 matched sites

- Both instruments use a nadir dwell scan
  - Eight gridded 0.25°× 0.25° boxes per minute
    - Up to 5 minutes of matched sites
    - VZA < 0.25 deg
    - Unprecedented spatial match of measurements
    - High confidence mean radiances (average of 330 footprints)
    - Selection of uniform scene types ahead of scheduling
    - Complementing simultaneous observations

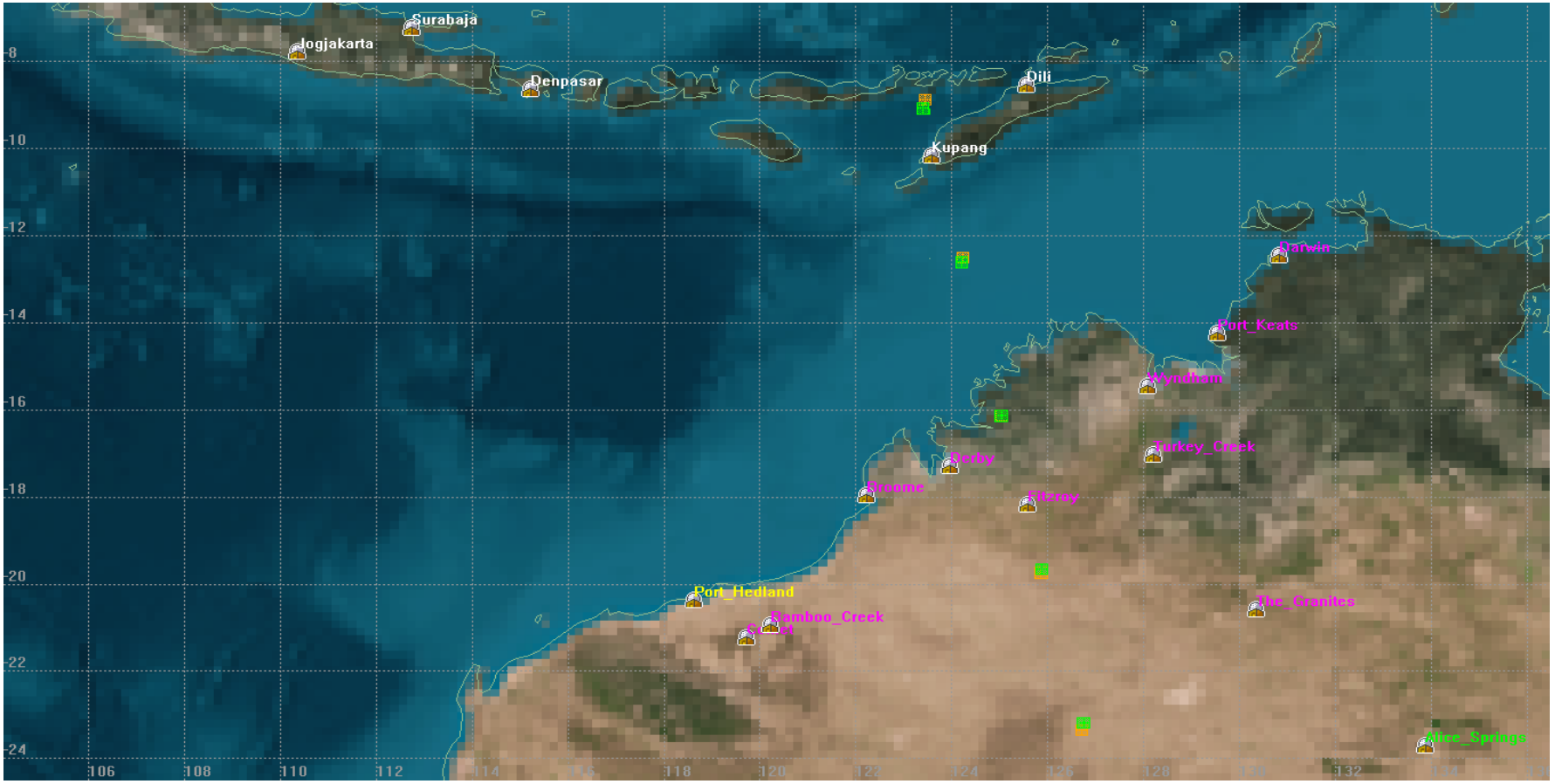
Trailblazer comparison opportunity in remote sensing

Nadir dwell scan profile



A factor of 5 higher precision of average then the XT gridded average

FM3 and FM5 matched sites

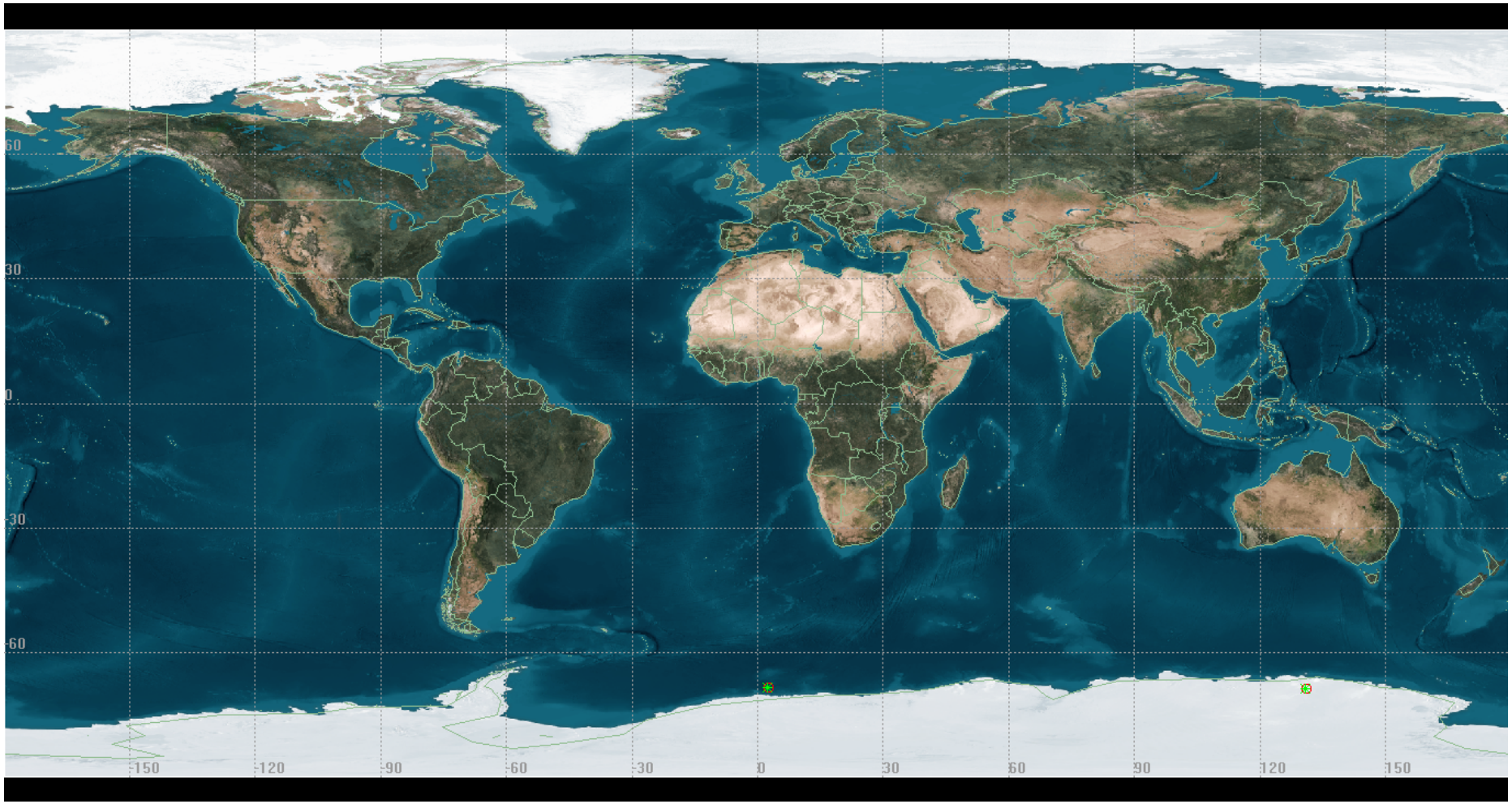


5 minutes long; 0.25° overlap

FM1/FM2 and FM5 comparison opportunities

- There is only one type of opportunities:
  - Matched sites (within 0.25deg)
    - Time differential < 5 min.
    - Groundtrack difference for lat < 1.0 deg.; lon < 1.0 deg
    - Comparison at the nadir within the size of a footprint
    - Duration of each opportunity about 14sec (2 scans) for uniform scene types
    - High confidence averages

FM1/FM2 and FM5 matched sites

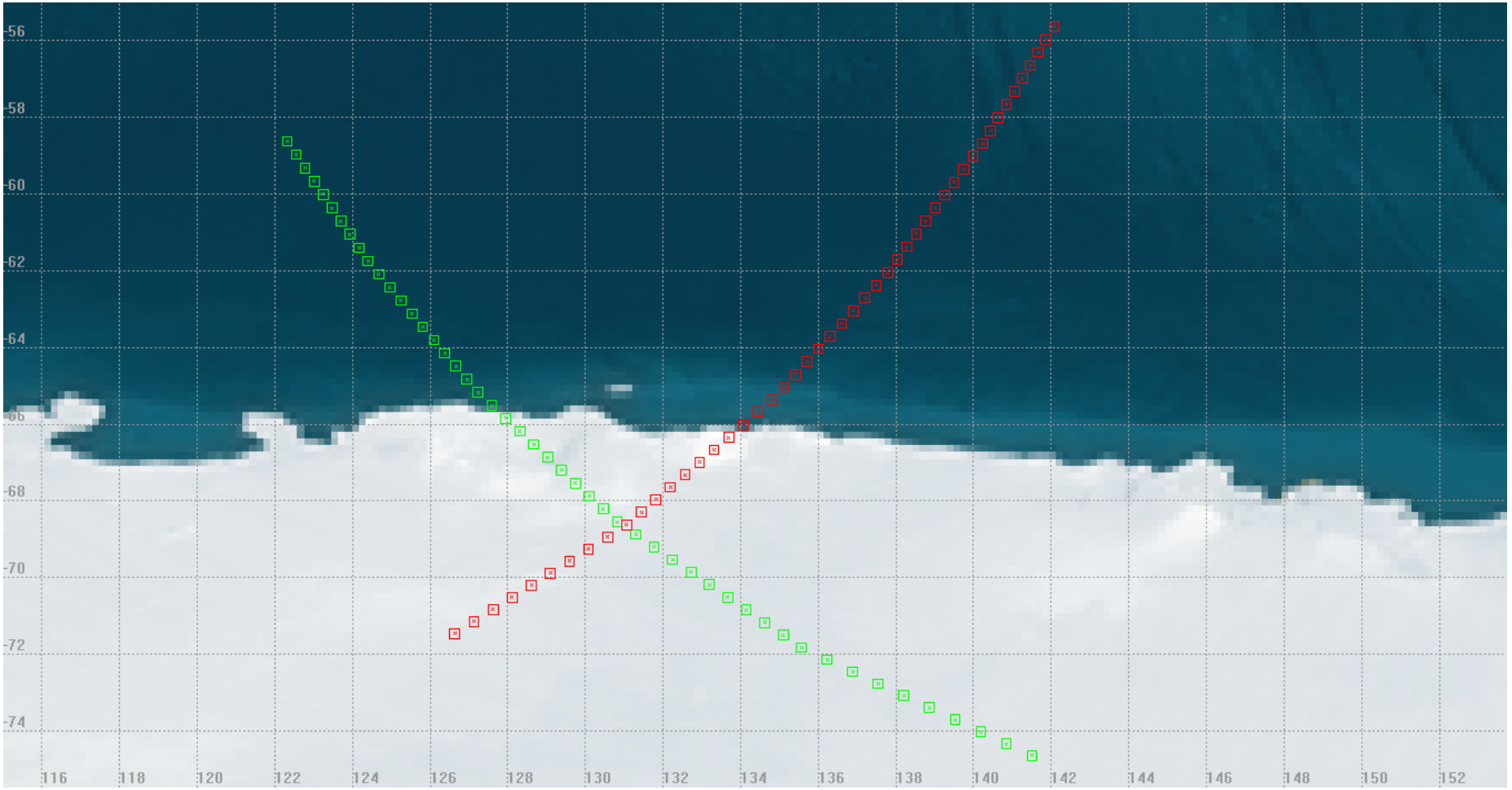


2 night opportunities within 27 days

FM1/FM2 and FM5 matched sites

- Both instruments use a nadir dwell scan
  - One gridded 1.0°×1.0° geolocation
    - VZA < 0.25 deg
      - Unprecedented spatial and temporal match for two different orbits
      - High precision mean radiances (average of 330 footprints)
      - Opportunity to compare with the climate instrument (FM1)

FM1/FM2 and FM5 matched sites



14 sec long; 1.0° overlap

Summary

- The use of XT data alone will require processing of about one year of data
  - No scanner maneuvering needed (matches every 64h)
  - First results available within 6 months
  - Stats improving with time
- The use of nadir dwell scan profile
  - Unprecedented data precision for matched sites
  - Nadir footprints comparison
  - XT data dropout very minimal (about 20 min per month)
  - Enables also Terra/NPP comparison